Environment: Dealing with Climate Change

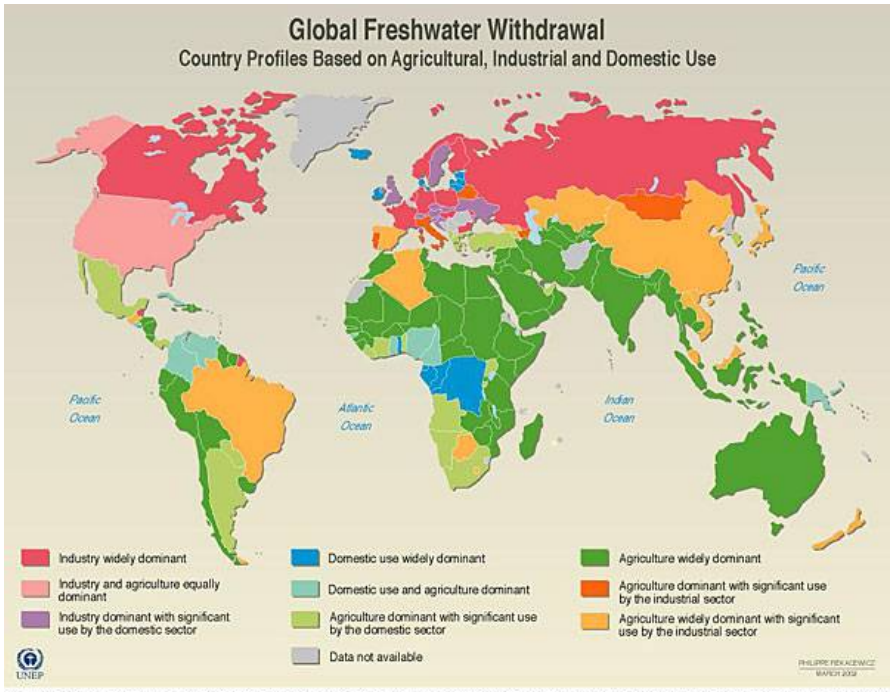
The Crisis of Water Management

Summary

A global 'water crisis' looms large for many developing countries. Managing the world's water supplies involves navigating the conflicting needs arising from economic growth, poverty, food security, political stability and climate change. How can water be used more productively in developing countries?

How can water waste be reduced, water sanitation be increased, new water sources be used, and existing water sources be conserved? How do local circumstances determine the optimal mix of these strategies? How are the demands of economic markets (cost recovery and user financing) to be reconciled with the demands for equitable access to water and poverty reduction?

What policy framework (e.g. regulations and taxes) is desirable for achieving efficient and equitable water supply? What business opportunities will emerge that could contribute to satisfying the world's need for water? Should water be reserved for food production, or can food security equally be guaranteed through trade, by importing food rather than growing it?



Source: Based on data fromTable FW1 in *World Resources 2000-2001, People and Ecosystems: The Fraying Web of Life*, World Resources Institute (WRI), Washington DC, 2000.

Proposed Solutions

Expert Opinion

Solutions need to be tailored to specific, widely varying natural, cultural, economic and political circumstances. In developing countries, water is still predominantly used by the agricultural sector, in particular for irrigation (see graph), which suggests that a successful strategy for overcoming the water crisis has to focus on this sector. Research undertaken by the International Food Policy Research Institute (IFPRI) point to three broad strategies for national governments, international donors, and water users:

- increase the supply of water for farmers, households, and industries by investing in infrastructure;
- conserve water and make existing systems more efficient by reforming water management and policy and investing in improved technology and infrastructure in these systems; and
- increase crop productivity per unit of water and land by improving water management and directing research and policy efforts toward rainfed agriculture.

It is crucial to invest in expanding household and industrial water supplies, but rising financial and environmental costs will limit the expansion of irrigation water supply. Hard infrastructure investment still has a role to play in the future in some regions but a reduced one compared with past trends, when dam-building and expansion of irrigated area drove rapid increases in irrigated area and crop yields particularly in developing countries.

The most effective means of dealing with water scarcity is likely to be making existing water uses more efficient through new technologies and improved pricing policies. Efficiency in irrigation water use can be enhanced by technologies like drip irrigation and precision agriculture, management changes like the adoption of demand-based irrigation scheduling systems, and institutional improvements like the creation of effective water user associations. Industrial water recycling can be a major source of water savings in many countries. Domestic water use can be made more efficient by steps ranging from repairing leaks in municipal systems to installing low-flow showerheads.

Reform of water pricing policy in developing countries faces many technical, administrative, and political constraints, but with increasing water scarcity and declining financial resources available for irrigation and water resource development, reform of water pricing is essential. For both urban and agricultural water, innovative and pragmatic water pricing reform that introduces incentives for efficient use and enhances cost recovery while improving equity in water allocation is feasible. Agricultural water pricing reform that establishes water rights for users would be particularly beneficial, protecting farmers against changes in water allocation, ensuring that they benefit from more efficient water use, and in the longer term providing a basis for water trading among farmers and across sectors,

Rainfed agriculture also emerges as a potential key to the sustainable development of water and food. Improved water management and crop productivity in rainfed areas would help relieve pressure on irrigated agriculture and on water resources. Exploiting the full potential of rainfed agriculture, however, will require investing in water harvesting technologies, crop breeding targeted to rainfed environments, agricultural extension services, and access to markets, credit, and input supplies in rainfed areas.

These strategies can avert the impending water crisis that much of the world faces, but they will require time, political commitment, and money. If these strategies are to succeed, they must begin now.

Strategy Perspectives

The Crisis of Water Management: Response

Lester R. Brown

Founder and President, Earth Policy Institute

The situation with water today is similar to that with cropland a half century ago. During the 1950s when we projected world population growth to the end of the century we realized that even then there was little new land to bring under the plow. In response, the world launched a systematic effort to raise grainland productivity by investing in research, replacing ceiling prices for agricultural commodities with support prices, expanding farm credit, and investing in agricultural infrastructure. As a result world grain yield per hectare has nearly tripled since 1950.

We need to do the same thing with water, namely launch a worldwide effort to systematically raise water productivity of the sort that nearly tripled grainland productivity between 1950 and 2008. And, since 70 percent of the world's water use is for irrigation, adopting the most water-efficient irrigation systems is obviously at the top of the list. There is also a need in some situations to switch to more water-efficient crops, i.e. from wheat to rice.

In industries and cities, which count for 20 and 10 percent, respectively, of world water use, the emphasis should be both on using more water efficiently, and, more fundamentally, on recycling water indefinitely as some corporations are now doing and some cities are beginning to do. And just as pricing of grain played an important role in raising grainland productivity, so too pricing water to reflect its current value rather than its historical value is one of the keys to raising water productivity.

Water Crisis Is Not a Technical Problem

Charles Gordon

President and CEO, Siemens Water Technologies

Affordable and safe water supply is imperative for the future economic growth and stability in developing countries. The challenges facing water supply and safety are complex, yet not insurmountable. They are manageable, if we act deliberately and collectively and place a higher economic and political priority on clean water. Traditionally, we have undervalued the worth of water and have under funded projects capable of delivering a sustainable supply.

Better infrastructure, conservation and education – along with innovative technology – will provide a sustainable future for our water resources. We expect that new product developments will primarily be focused on the economics of the treatment. It is not a question of availability of products and solutions to meet the quality needs it is the reduction of energy consumption and carbon emissions which will drive innovation.

In addition to conservation and better infrastructure, the water governance model will play a critical role in solving the crisis. Recognizing the true economic value of safe and clean water based on replacement costs is the real challenge of the crisis. Water reuse and recycle for

example can help reduce the burden on source water and energy used while providing an alternative supply for industry, agriculture and communities. The roadblock is still the public perception of using recycled water for potable use. Today this issue leads to spending for a separate infrastructure for industrial and agricultural reuse.

We have seen first examples of innovative solutions in places like Singapore, Israel and California where shortages in water are driving reuse applications. Reuse technologies can also be applied to developing regions for example stand-alone satellite treatment systems can treat wastewater or small solar-powered membrane units can treat river water for small villages in Kenya and India.

From our perspective a governance model that manages complete water systems along with public education is crucial to ensure a long-term sustainable water supply.

Statement on Water

Joachim von Braun

Director General, International Food Policy Research Institute

We at the International Food Policy Research Institute (IFPRI) suggest three broad strategies for national governments, international donors, and water users to address the current and emerging water crisis:

- increase the supply of water for farmers, households, and industries by investing in infrastructure;
- conserve water and make existing systems more efficient by reforming water management and policy and investing in improved technology and infrastructure in these systems; and
- increase crop productivity per unit of water and land by improving water management and directing research and policy efforts toward rain-fed agriculture.

Urban and industrial water demand, climate change impacts, and water needs for agriculture will be the most significant drivers of water scarcity. The solutions for addressing increased water scarcity need to address all these three drivers with the combination of four components in the context of the above mentioned strategy.

Solution Component 1: Improving Knowledge about Availability, Innovation, and Allocation in the Light of Economic and Environmental Global Change

We need not only address today's water issues but those of the future now. Investing in the water knowledge base of all actors in water use is needed, especially at local and national levels. About 70% of the world's extracted fresh water is currently consumed by agriculture. Adaptation to climate change requires adaptation of agriculture toward increased water use efficiency, and that is knowledge- and technology-intensive. Colin Chartres, DG of the International Water Management Institute (IWMI) points out that we need to find at least a further 2000 to 3000 cubic kilometers of water for irrigated and rain-fed cropping by 2030, and this is about 33% of what is currently used. It takes 1 liter of water to grow 1 calorie of food and as more people move to western style diets an average person will be "consuming" 2500-3000 liters of water per day that has been used to grow their food. Higher education and research in water management, infrastructure, technology, and related policy must expand fast to address the knowledge gaps.

Solution Component 2: Increasing Crop Productivity (Total Factor Productivity Including Qater Productivity) in Irrigation and Dry-land Environments

Increasing the productivity of existing irrigation and rain-fed production systems is possible given investment in appropriate research and development that leads to better crop cultivars (including drought resistance), better farm management and better soil water storage. Some developed as well as developing countries are being impacted by water scarcity. Scarcity needs to be viewed as either physical or economic. In the case of the latter and particularly in SS Africa investment in infrastructure can solve most water problems, whereas this is not the case in Asia where countries are physically water scarce. In sub-Saharan Africa, water storage per head is a low as 38 cubic meters, compared to the US or Australia where approximately 4-6000 cubic meters are available per person. Improving water storage can be achieved not only by large dams (which should not be "taboo", as they are required in some countries), but also through a range of other options. These options include better use of groundwater, water harvesting on small plots to small irrigation schemes fed by small reservoirs. All have a role in helping people have enough water for food production and domestic supplies. A key part of this solution is local financing through banking institutions that can take a long run view. Public support is need for that.

Solution Component 3: Improved and Expand Safe Reuse of (Waste) Water

Increase of the reuse of water is central to expansion of supply. It will be difficult to significantly reduce waste water, sewage etc. with existing infrastructure, but it can be ensured that reuse of waste water is better managed and more safely (reduce the waste of "waste water"). New infrastructure, especially in peri-urban areas are needed in developing countries. New technologies, such as nanotechnology based filters and desalination technologies should be explored more. The main potential source of water from re-use, however, is in agriculture through improved drainage and its cleanup.

Solution Component 4: Policy, Institutional and Regulatory Reform to Improve Governance of all Areas of Water from Basins to Farmer Managed Irrigation and Building Water Markets at Different Scales

The above mentioned three solutions all need policy and institutional change. In farming, the real price (or cost) of water must apply to achieve efficient use. Local governance of water, based on transparent rights and frameworks, is part of this solution. A key issue is that we need to look at all water in terms of availability, uses and beneficiaries etc., rather than compartmentalizing water into agriculture versus drinking/sanitation versus environmental etc. This is where virtual water through trade of water intensive products comes in as an important option: A water-scarce world needs to have open agricultural trade. The increased scarcity of water means increased costs and increased price of water –explicitly or implicitly. In addition, an international fresh water market is emerging (incl. new corporations with bulk shipments like for oil). We need a transparent water trading system (possibly with a commodities futures market for water of standardized quality) coupled with government regulation, and protection of the poor. The poor must not be priced out of the water markets. They often currently are, as they tend to pay the highest unit price for water and need to be supported to access affordable household water.

In sum, the solutions need to combine investment in knowledge, technology, institutional innovations, and policy change. There is not just one solution, and all solutions to global water problems have regional and local dimensions.